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The FOREST INSECT situation

LAKE STATES 1955

by
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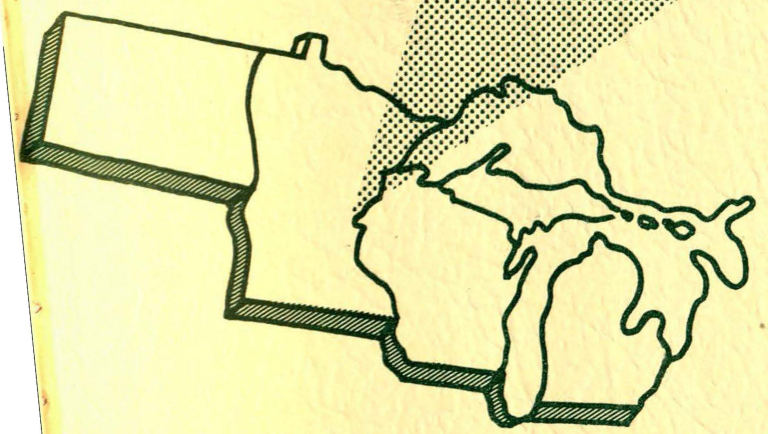

LAKE STATES FOREST EXPERIMENT STATI
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FOREWORD

The forest insect problem is the concern of everyone interested in the Nation's vast timber resource. Insect outbreaks have little regard for property lines; therefore, their detection, appraisal, and control are not the responsibility of any one agency. This report is a compilation of data from many sources to show the present forest insect conditions in the three Lake States--Minnesota, Wisconsin, and Michigan. Grateful acknowledgment is made by the authors to the following agencies, which have contributed information: The Offices of the State Entomologists, State Conservation Departments, the universities, private industry, and various federal agencies.

Cover picture: Jack-pine budworm showing the full-grown larva, the pupa, and the characteristic webbing of the jack pine needles associated with larval feeding.

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L. C. Beckwith
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M. B. Dickerman, Director

Forest Service, U. S. Department of Agriculture

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THE FOREST INSECT SITUATION, LAKE STATES, 1955

By

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INTRODUCTION

Protection of our forests against insects is as important, or more so, than fire protection. Although usually not as spectacular as the destruction caused by fire, insect damage is actually seven times heavier throughout the Nation. Not only do insects kill mature trees, but they attack and ruin the forest from seed to the finished product by reducing stocking, growth of the trees, and quality of the lumber or other wood products.

Insects an Acute Problem in Plantations

One of the foremost forest insect problems in the Lake States concerns the protection of a large number of plantations covering 2 million acres. Consequently, pests that are serious plagues in coniferous plantations have received the most attention. The major plantation pests treated in this report are:

1. Saratoga spittlebug on red and jack pine: Currently this is the most destructive pest of red pine plantations. Approximately 12,000 acres were sprayed during 1955.

1/ Maintained by the U. S. Department of Agriculture, Forest Service, in cooperation with the University of Minnesota, St. Paul 1, Minnesota.

2. European pine shoot moth on red and Scotch pine: This insect is rapidly becoming a very serious problem in red pine plantations in Michigan and Wisconsin.

3. White-pine weevil mainly on white pine, jack pine, and Norway spruce: Killing of the terminal tip on as many as 60 percent of the trees is common in plantations of white and jack pines. The damage reduces both volume and quality of lumber produced.

4. Pine tortoise scale on jack pine: Infestations declined in Wisconsin, but heavy infestations persist in two areas of Michigan.

5. Pine sawflies on various pine hosts: Heavy feeding by the introduced pine sawfly (Diprion similis (Htg.)) was reported in Wisconsin and Minnesota with some tree mortality. The European pine sawfly (Neodiprion sertifer (Geoff.)) continued to be a major pest throughout the southern half of the Lower Peninsula.

Four Insects of Major Importance
in Natural Stands

Four species of forest insects, also of major importance in the Lake States, are primarily pests in natural stands. These are:

1. Spruce budworm: This deadly ravager of the mature spruce-fir type is currently causing noticeable defoliation in the Keweenaw Peninsula of Michigan, and near the Canadian border in northern Minnesota.

2. Larch sawfly: The current outbreak which began about 1948 is causing growth reduction in all tamarack stands, and mortality is occurring in small areas scattered over thousands of acres.

3. Forest tent caterpillar: This cyclic pest is defoliating millions of acres of the aspen type.

4. Jack-pine budworm: Closely related to the spruce budworm, this pest is destructive to natural stands of jack pine and older plantations.

MAJOR FOREST INSECT PESTS IN 1955

The status of each of the major forest insect pests in the Lake States is discussed on the following pages. The more important species are dealt with in some detail, while those of less importance are mentioned only briefly. Minor infestations of a local nature are generally omitted.

The Spruce Budworm--A New Menace

The spruce budworm (Choristoneura fumiferana (Clem.)) has caused more monetary loss to the coniferous type in the United States and Canada than any other insect. Once again it is becoming a potentially dangerous pest to the spruce-fir type in the Lake States (fig. 1).

In the northern part of this region there are approximately 2.5 million acres of the spruce-fir type with balsam fir predominating, and about 1.5 million acres of aspen-birch type in which conversion to spruce-fir appears to be taking place. The merchantable volume of balsam fir in the spruce-fir type is about 1 billion cubic feet. The total annual drain of all balsam fir is about 32 million cubic feet of which approximately 97% is used by the pulp and paper industries of the region.

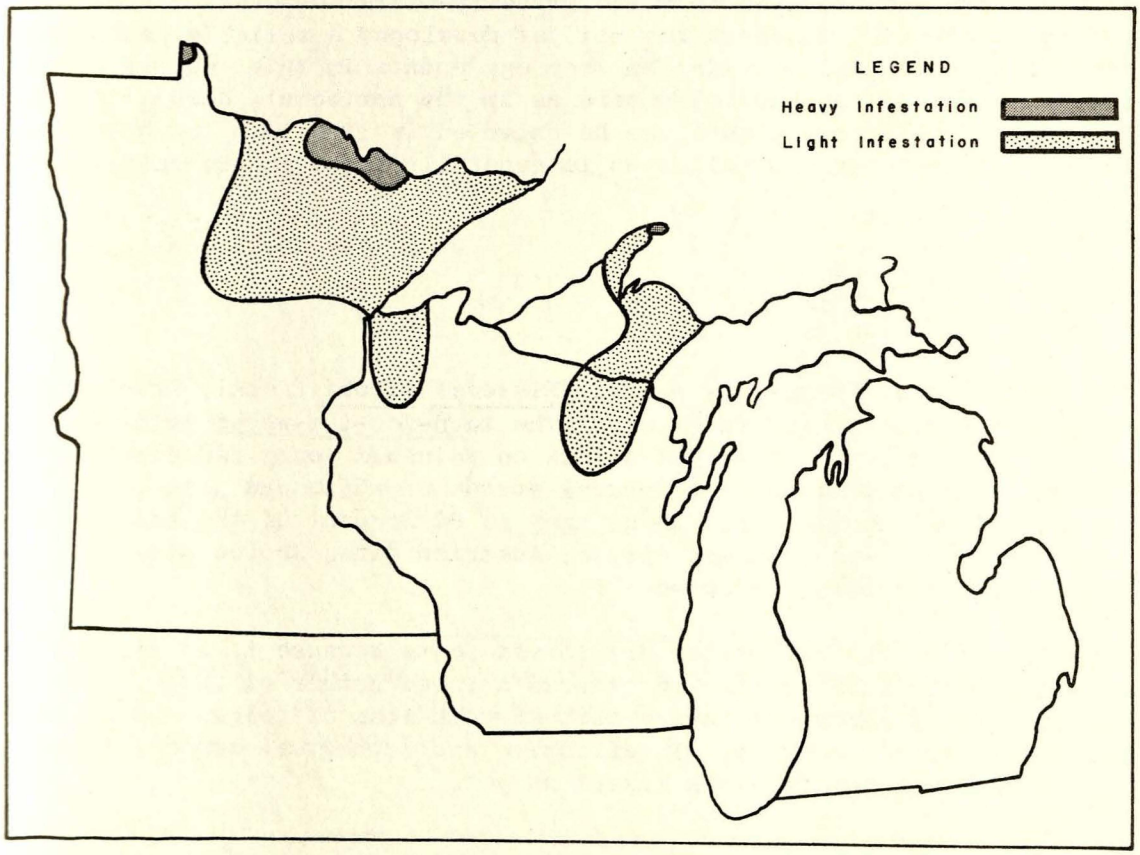

Figure 1.--Defoliation surveys showed that much of the spruce-fir type in the Lake States was infested by the spruce budworm.

Analysis of data from cooperators shows that the spruce budworm is present in most of the spruce-fir stands in the region. Larvae were collected at 75 of the 159 detection points established in the three Lake States (88 of the points were in Minnesota, 14 in Wisconsin, and 57 in Michigan). Additional evidence was obtained at 65 permanent egg mass collecting points in Minnesota where defoliation estimates were made. A general aerial reconnaissance showed noticeable to heavy defoliation along the Canadian border from International Falls east to Basswood Lake. Heavy defoliation was also reported in the Northwest Angle by the Canadian aerial survey organization. On the other hand, the outbreak condition in the Keweenaw Peninsula declined sharply, and much dead and dying fir has been removed. The area that exhibited heavy defoliation in 1955 will probably be only lightly infested in 1956 because of a sharp reduction in population after larval feeding. This reduction was due to a number of factors including starvation, parasitism, and salvage logging.

The Station staff received assistance in making egg mass surveys this year in Minnesota and Michigan from the Kimberly-Clark Corporation and State survey personnel. Research has not yet developed a reliable method for predicting potential defoliation from egg counts in this region; however, if the same relationship holds here as in the Northeast, defoliation of 50 percent of the new growth can be expected in 1956 in a few areas along the Canadian border. Defoliation is generally light in the remainder of Minnesota.

The White-Pine Weevil--Attacks Increasing

The ever-present white-pine weevil (*Pissodes strobi* (Peck)) problem has become even more vexing this year. The turn-for-the-worse involves an increasing incidence of weevil attack on valuable young red pine plantations. In plantations and natural stands of white and jack pines, killing of the terminal tip on as many as 60 percent of the trees is common. In addition, Norway spruce, Austrian pine, Scotch pine, and Douglas fir are often infested.

This is one of the more important forest pests because it is distributed throughout the Lake States and attacks a large number of hosts. It causes a large amount of damage through both loss of volume and a reduction in lumber quality. No effective and economical control measures have been developed for this insect as yet.

The European Pine Shoot Moth-- A Serious Threat to Red Pine Plantations

The European pine shoot moth (Rhyacionia buoliana (Schiff.)) poses a most serious problem in red pine plantations of Michigan and Wisconsin. If the present population trends continue, and if effective control measures are not found, red pine will be decidedly less favored for reforestation in the southern part of the Lake States. The area of known infestation this year (fig. 2) covers about two-thirds of the Lower Peninsula of Michigan, a small area near Houghton in the Upper Peninsula, and about a dozen counties in southeastern Wisconsin.

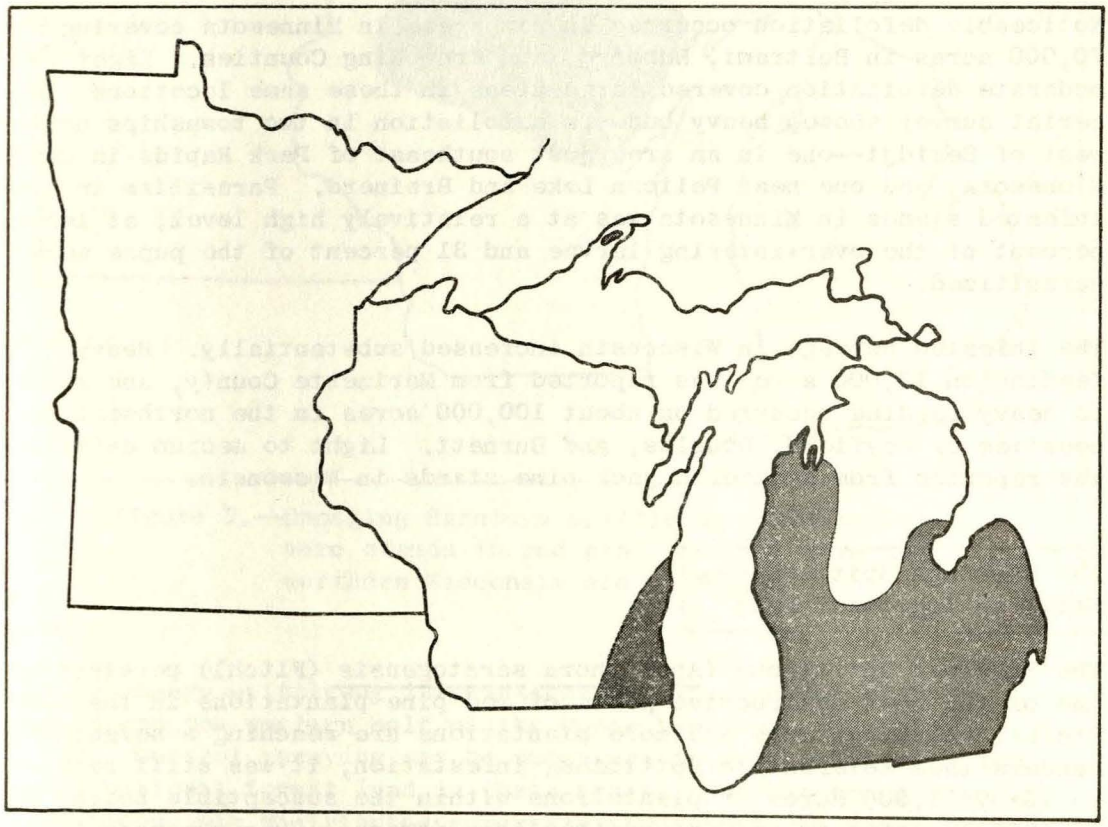

Figure 2.--Red pine plantations in southeastern Wisconsin and in Michigan were heavily infested by the European pine shoot moth.

Control measures, using DDT-in-oil spray, have been tried in small areas of state, private, and national forest lands, but so far have not been entirely satisfactory. Other methods attempted include destroying the infested buds, and cutting and burning whole plantations. These latter two methods are temporary stop-gap procedures which are too expensive, time consuming, and drastic to be of general use.

The Jack-Pine Budworm--Populations Increasing

Throughout Minnesota and Wisconsin populations of the jack-pine budworm (Choristoneura pinus Free.) have been increasing. In Michigan the defoliation was at a lower level than in 1954.

In the Upper Peninsula, Luce County populations continued to shift eastward into more open-grown jack pine; the infestation in Chippewa County apparently is disappearing. Pupal parasitism averaged 36 percent and 52 percent in two sample areas in Luce and Chippewa Counties, respectively--a substantial increase over that in 1954.

Noticeable defoliation occurred in six areas in Minnesota covering about 70,000 acres in Beltrami, Hubbard, and Crow Wing Counties. Light to moderate defoliation covered large areas in these same locations. An aerial survey showed heavy budworm defoliation in two townships northwest of Bemidji--one in an area just southeast of Park Rapids in central Minnesota, and one near Pelican Lake and Brainerd. Parasitism in heavily infested stands in Minnesota was at a relatively high level; at least 10 percent of the overwintering larvae and 31 percent of the pupae were parasitized.

The infested acreage in Wisconsin increased substantially. Heavy feeding on 13,000 acres was reported from Marinette County, and moderate to heavy feeding occurred on about 100,000 acres in the northwestern counties of Bayfield, Douglas, and Burnett. Light to medium defoliation was reported from scattered jack pine stands in Wisconsin.

The Saratoga Spittlebug--Still an Important Pest

The Saratoga spittlebug (Aphrophora saratogensis (Fitch)) persists as one of the most destructive pests of red pine plantations in the Lake States. Although more and more plantations are reaching a height which renders them tolerant to spittlebug infestation, it was still necessary to spray 12,000 acres of plantations within the susceptible height range in 1955 in order to prevent serious tree damage. Over the past 11 years, an average of about 5,300 acres of red pine and jack pine plantations has been sprayed annually in Wisconsin and Upper Michigan. Most of the control work has been done on national forest land with airplane applications of a DDT-in-oil solution, but plantations on state and private land have also been treated during the past 2 years with mist-blower and aerial applications of DDT.

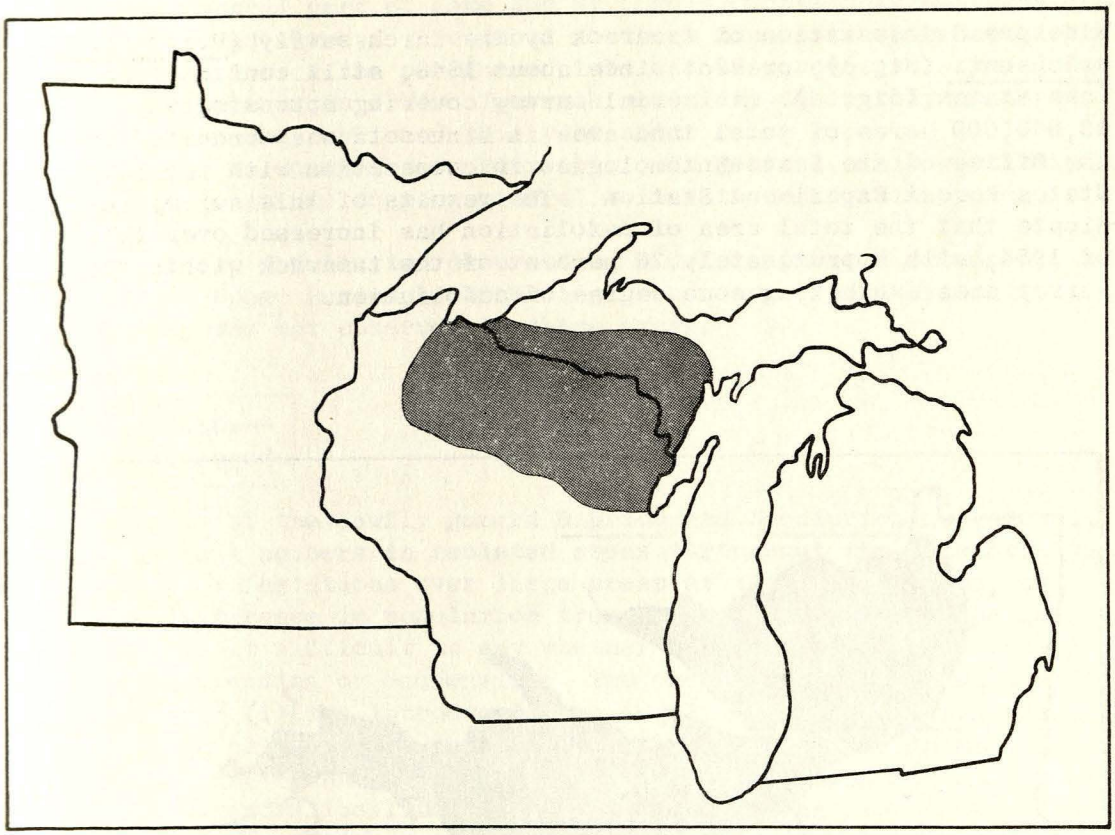

Figure 3.--Damaging Saratoga spittlebug infestations were common in red pine and jack pine in northern Wisconsin and Michigan.

Currently, heavy spittlebug infestations are limited to northern Wisconsin and the western half of the Upper Peninsula of Michigan (fig. 3). Control spraying may be necessary in 1956 on about 6,400 acres of national forest land in these areas. Endemic populations of the spittlebug are distributed generally throughout the remaining plantation areas of the Lake States with outbreaks occurring occasionally. No infestations have been reported in the plantations established in grassy fields in southern Wisconsin and Michigan, where suitable nymphal hosts are lacking.

The Larch Sawfly--Infestations Continue

Widespread infestation of tamarack by the larch sawfly (Pristiphora erichsonii (Htg.)), present since about 1948, still continues in the Lake States (fig. 4). An aerial survey covering approximately 13,000,000 acres of total land area in Minnesota was conducted by the Office of the State Entomologist in cooperation with the Lake States Forest Experiment Station. The results of this survey indicate that the total area of defoliation has increased over that of 1954, with approximately 78 percent of the tamarack within the survey area exhibiting some degree of defoliation.

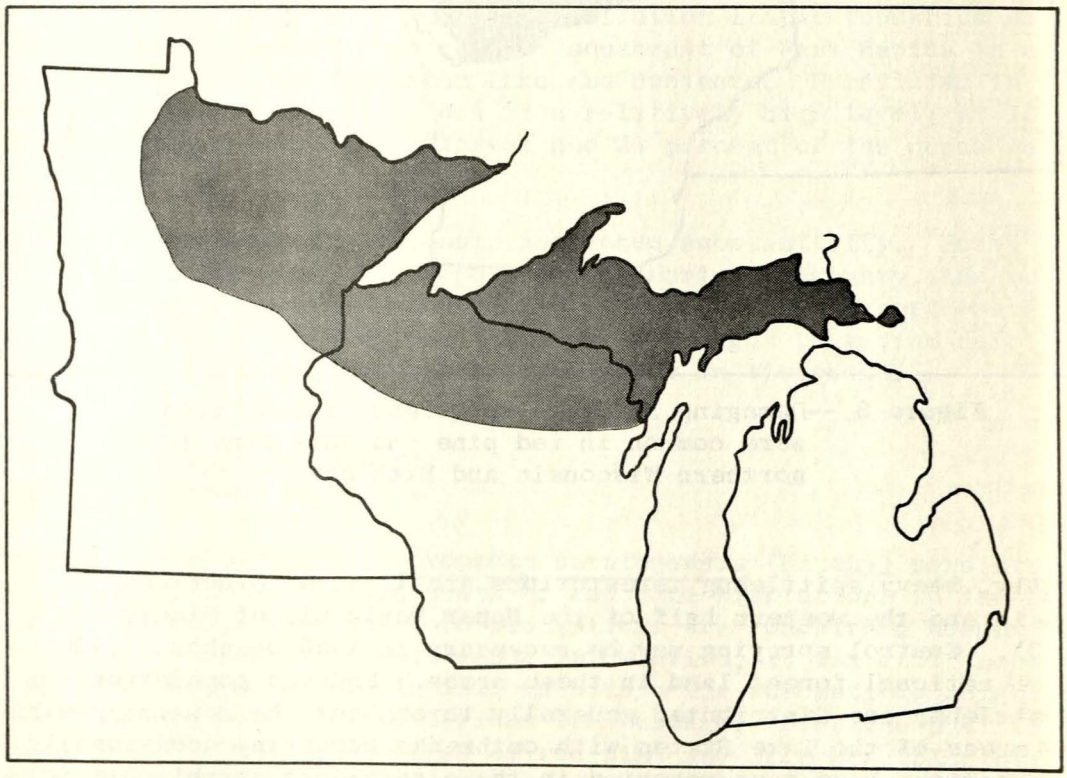

Figure 4.--Tamarack stands in the northern Lake States were completely defoliated by epidemic larch sawfly infestations.

The majority of stands showing complete defoliation are located in the north-central part of the state. However, heavy defoliation was also noted in the central part of Lake and St. Louis Counties in northeastern Minnesota. Ground surveys throughout northern Minnesota showed that the average defoliation in the permanent plots was 77 percent this year, compared with 61 percent in 1954. Tamarack mortality definitely resulting from defoliation was confirmed this year after being reported in 1954 in scattered areas in northeastern Minnesota. In general, this mortality occurred only in stands on poor mineral soil with rocky outcroppings.

Moderate to heavy defoliation occurred in widely separated stands throughout the Upper Peninsula of Michigan and in northern Wisconsin. Tree mortality was not observed in these areas.

The Pine Sawflies--Situation Unchanged

Several species of the sawfly genera Diprion and Neodiprion occasionally occur in outbreak numbers in isolated areas throughout the Lake States. The absence of infestations over large areas at the present time, as well as the difference in population trends among the several species involved, makes it difficult to say whether pine sawfly infestations in general are increasing or decreasing. Two exceptions to this statement are noteworthy: (1) the introduced pine sawfly (Diprion similis (Htg.)) was reported in all counties in northwestern Wisconsin and in many sections of central and east-central Minnesota, with heavy feeding and some mortality occurring in numerous localities; and (2) the European pine sawfly (Neodiprion sertifer (Geoff.)) continued to be a major pest of red pine throughout the southern half of Lower Michigan.

Other species which have become epidemic in localized, widely scattered areas are: the red-headed pine sawfly (Neodiprion lecontei (Fitch.)) in red and jack pine plantations, the jack pine sawfly (Neodiprion americanus banksianae (Roh.)) on jack pine, and the red pine sawfly (Neodiprion nanulus (Schedl.)) on red pine.

Control of the above pests has been carried out in a few generally small, localized areas by aerial or hand application of DDT-in-oil spray. Control measures are usually taken only in particularly heavy infestations of D. similis and N. lecontei. Both pests are capable of causing mortality by completely defoliating trees of both old and new needles.

The Forest Tent Caterpillar--Populations Waning

Records dating back into the 19th Century show that the forest tent caterpillar (Malacosoma disstria Hbn.) has periodically become epidemic in the Lake States at approximately 10-year intervals. Complete defoliation of vast acreages of aspen occurs for one, two, or more years during outbreak periods. Strangely enough, during the low ebb of the population cycle, it is nearly impossible to collect a single specimen. During population peaks, on the other hand, roads often become slippery with hordes of migrating caterpillars.

The current infestation began in northern Minnesota in 1949. During the next year or two, rising populations were noted in Wisconsin and Michigan. By 1953 the peak of the cycle was reached in Minnesota with subsequent heavy defoliation of millions of acres of aspen. By 1955, populations in Wisconsin were declining, although some 9 million acres (gross) were still infested. In northern Minnesota and the Upper Peninsula of Michigan heavy defoliation was restricted to relatively small acreages in 1955.

The factors responsible for the eclipse of the forest tent caterpillar outbreak are varied. Probably the most important are starvation of the young caterpillars (when they have literally "eaten themselves out of house and home"), and extremely high cocoon mortality due to a parasitic fly (Sarcophaga aldrichi (Park.)). Control spraying of infested areas with DDT, while effective, is generally not practiced since little or no aspen mortality is noted even after 2 to 5 years of complete defoliation. Occasionally, when either the caterpillars themselves or the associated parasitic flies become so numerous as to annoy tourists, resort owners will spray aspen stands surrounding their establishments.

The Pine Tortoise Scale--Outbreak Declining

In 1953 the pine tortoise scale (Toumeyella numismaticum (P. & M.)) suddenly reached outbreak proportions in several areas in northern Wisconsin and Michigan. Mortality up to 75 percent of the jack pines occurred in these areas in 1954. Approximately 7 percent of the trees escaped injury, apparently because of genetic immunity. Control spraying with malathion was carried out by the State of Wisconsin last year but, unfortunately, evaluation of the control was impossible because of the high degree of natural scale mortality in check plots. This year a marked reduction in scale populations was noted throughout Wisconsin. Heavy infestations still persisted in two areas of about 2,000 acres each in Delta and Schoolcraft Counties of Michigan's Upper Peninsula. Th

There is reason to believe that natural factors will control these latter two infestations and thus remove jack pine from the "critical list" as far as tortoise scale is concerned. A survey will be made next May, however, to check the status of the insect.

The Walkingstick-- Odd-Year Infestations

The northern walkingstick (Diapheromera femorata (Say)) appears only every second year in the Lake States because the eggs generally remain dormant for two winters before hatching. Most areas in Minnesota and Wisconsin have odd-year broods; whereas in Michigan, serious infestations are generally caused by even-year broods. In 1955, the insect was at its lowest population level in Minnesota since 1941, but in east-central Wisconsin the trees in certain localities were completely defoliated. Approximately 1,000 acres of high-value oak woodland on the Menominee Indian Reservation were sprayed--very satisfactory control resulting. Inasmuch as this is the "off-year" for most walkingstick infestations in Michigan, no serious defoliation was observed there.

The Gypsy Moth-- All-Out War in Michigan

The gypsy moth (Porthetria dispar (L.)) remained a number one problem in the vicinity of Lansing, Michigan. Based on an extensive trapping and scouting program conducted in 1954 and 1955, 25,000 acres in this locality were sprayed in cooperation with the Michigan Department of Agriculture. This acreage included respraying 6,400 acres that had been treated in 1954. Another thorough trapping program, consisting of 5,000 traps covering 1,700,000 acres surrounding the original infestation, was conducted during 1955; 19 of the traps yielded 30 gypsy moths. It is expected that approximately 40,000 acres will be sprayed in 1956. An egg mass survey being conducted at the present time will determine the actual acreage to be treated.

The Pine Leaf Aphid-- Apparent Serious Threat Declining

The pine leaf aphid (Pineus pinifoliae (Fitch)) caused considerable browning of white pine throughout northeastern Minnesota. Some mortality occurred in smaller trees, but most of the infested trees appeared to be recovering. The large area of infestation prompted a

study in cooperation with the Quetico-Superior Wilderness Research Center. Examinations on five plots, which showed populations on white pine to be low, resulted in the cancellation of an experimental control effort. Natural factors caused a marked decline in the gall stage on black spruce. The plots will be followed closely for a few years to study population fluctuations and to observe the effect on the trees.

The Variable Oak Leaf Caterpillar-- In Outbreak This Year

The variable oak leaf caterpillar (Heterocampa manteo (Dbldy.)) sporadically causes severe defoliation of hardwood stands in the Lake States. Large areas of susceptible oak and birch in the northwestern part of Minnesota were completely defoliated by this insect in 1955. Heavy feeding also occurred in some stands in northern Wisconsin. No control measures are contemplated since outbreaks of this pest generally die out before causing serious tree damage.

The Birch Leaf Skeletonizer-- Causes Widespread Defoliation of Paper Birch

The birch leaf skeletonizer (Bucculatrix canadensisella (Chamb.)) caused widespread defoliation of paper birch throughout the northern Lake States in 1955 as it has for the past 2 years. Very little serious damage occurs, as the attack comes so late in the season that the leaves have performed the major part of their function. Repeated defoliation probably causes some growth loss. The premature browning and dropping of leaves have caused consternation among resort owners; many of them are seeking an effective method for preventing defoliation.

The Larch Casebearer-- Infestation Generally Light

Moderate to heavy feeding by the larch casebearer (Coleophora laricella (Hbn.)) occurred locally in tamarack stands in Michigan and Wisconsin. Throughout the Lake States area as a whole, the infestation, as in 1954, was light.

The Smaller European Elm Bark Beetle-- Dutch Elm Disease Vector

The smaller European bark beetle (Scolytus multistriatus (Marsh.)) occurred in Michigan and in localized areas in southern and southwestern Wisconsin. Although this beetle caused some direct mortality to elms, especially weakened trees, it is far more important as a vector of the Dutch elm disease. The disease occurs in Michigan. As yet, it has not been reported in Wisconsin, but probably will be soon, now that the vector is present. The beetle has not been found in Minnesota.

TABULAR SUMMARY

Table 1.--Major forest insects, 1955: hosts, feeding type, and location and degree of infestation

Name	Hosts	Feeding type	Infestation reported from:	Degree of infestation
Spruce budworm (Choristoneura fumiferana (Clem.))	Spruce-fir	Defoliator	Minnesota Michigan	Generally light--northern Upper Peninsula, northern Minnesota
European pine shoot moth (Rhyacionia buoliana (Schiff.))	Red pine	Meristem feeder	Michigan Wisconsin	Varies; generally heavy in Lower Michigan
White-pine weevil (Pissodes strobi (Peck))	White, jack, and red pine; Norway spruce	Cambium feeder	Wisconsin Michigan Minnesota	Light to heavy--no general pattern
Jack-pine budworm (Choristoneura pinus Free.)	Jack pine	Defoliator	Michigan Wisconsin Minnesota	Light to heavy in localized areas
Saratoga spittlebug (Aphrophora saratogensis (Fitch))	Red and jack pine	Sucking insect	Wisconsin Michigan Minnesota	Varies; generally heavy in northern Wisconsin and the western half of the Upper Peninsula
Larch sawfly (Pristiphora erichsonii (Htg.))	Tamarack	Defoliator	Minnesota Wisconsin Michigan	Varies; generally heavy in northern Minnesota
Pine sawflies (Diprion spp. and Neodiprion spp.)	Pinus spp.	Defoliators	Michigan Wisconsin Minnesota	Varies
Forest tent caterpillar (Malacosoma disstria Hbn.)	Aspen	Defoliator	Wisconsin Minnesota Michigan	Generally light; heavy in northwestern Wisconsin
Pine tortoise scale (Toumeyella numismaticum (P. & M.))	Jack pine	Sucking insect	Wisconsin Michigan	Generally light
Walkingstick (Diapheromera femorata (Say))	Oak, basswood	Defoliator	Wisconsin Minnesota Michigan	Generally light; heavy in east-central Wisconsin
Gypsy moth (Porthetria dispar (L.))	Hardwoods	Defoliator	Michigan	Light--southeastern Michigan
Pine leaf aphid (Pineus pinifoliae (Fitch))	White pine	Sucking insect	Minnesota	Light--northeastern Minnesota
Variable oak leaf caterpillar (Heterocampa manteo (Dbldy.))	Oak, birch	Defoliator	Minnesota Wisconsin	Light to heavy--northwestern Minnesota and northern Wisconsin
Birch leaf skeletonizer (Bucculatrix canadensisella Chamb.)	Birch	Defoliator	Wisconsin Michigan Minnesota	Varies; generally heavy in northern Wisconsin
Larch casebearer (Coleophora laricella (Hbn.))	Tamarack	Defoliator	Michigan Minnesota Wisconsin	Generally light
Elm bark beetle (Scolytus multistriatus (Marsh.))	Elm	Cambium feeder	Michigan Wisconsin	Light--southeastern Michigan and southeastern Wisconsin

Table 2.--Minor forest insects, 1955: hosts, feeding type, and location of infestation

Name	Hosts	Feeding type	Infestation reported from:
Anomala beetle (Anomala oblivia Horn)	Jack and red pine	Defoliator	Michigan
Pine spittlebug (Aphrophora parallela (Say))	Jack and Scotch pine	Sucking insect	Wisconsin, Michigan Minnesota
Pine needle miner (Exoteleia pinifoliella (Chamb.))	Jack pine	Needle miner	Michigan
Cherry scallop shell moth (Calocalpe undulata (L.))	Wild cherry	Defoliator	Michigan
Red-humped caterpillar (Schizura concinna (A. & S.))	Sugar maple	Defoliator	Michigan
Saddled prominent (Heterocampa guttivitta (Wlkr.))	Beech, maple	Defoliator	Wisconsin
Red-pine cone beetle (Conophthorus resinosae Hopk.)	Red pine	Cone, bud, and twig feeder	Wisconsin
Webworms (Tetralopha spp.)	Sugar maple and others	Defoliator	Wisconsin
Pine twig moth (Eucosma sonomana Kearfott)	Jack and red pine	Cambium feeder	Wisconsin, Michigan
Balsam fir sawfly (Neodiprion abietis (Harr.))	Balsam fir	Defoliator	Minnesota, Wisconsin, Michigan
Pitch nodule maker (Petrova albicapitana (Busck))	Jack pine	Cambium feeder	Minnesota, Wisconsin, Michigan
Black-headed budworm (Acleris variana (Fern.))	Balsam fir	Defoliator	Minnesota
Nantucket pine tip moth (Rhyacionia frustrana (Comst.))	Red pine	Cambium feeder	Michigan, Wisconsin Minnesota
Pine pitch midge (Retinodiplosis resinicola (O. S.))	Jack pine	Cambium feeder	Michigan

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